

THE EFFECTS OF INSULIN IN DIABETES AND STATISTICAL ANALYSIS THROUGH THE CORRELATION THEORY

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ABSTRACT: Everybody knows that the diabetes is a serious, chronic disease in the modern society. Diabetes is a condition in which the body cannot control the level of glucose. In this research paper, the aim of this study is to maintain the glucose level of diabetes patients within the healthy range by the insulin. We gave the effects of insulin in diabetes through the correlation theory and predict the glucose level is going on normal or not to resolve the diabetes problem.

KEYWORD: Insulin in units as x variable, Glucose level in mg/dl for fasting as y variable, Correlation Analysis and also testing the significance level of correlation coefficient using t-test.

INTRODUCTION: In this research study, we may be interested to observe the relationship between doses of insulin with the decreasing tendency of glucose level. The significance of correlation may also be an interest of their study using statistical test like t-test etc. In the correlation, if with the changes in the value of one variable for insulin doses, the value of other variable for glucose level also changes then they are said to be co-related to each other. There are two types of the correlation. Positive correlation^[1], Negative correlation^[2]. In the positive correlation, when increases the doses of insulin in small units corresponding to increase the glucose level but foods and physical activity also included with. In the negative correlation, when increases the doses of insulin in units correspond to increases glucose level.

Everybody knows that the diabetes is a chronic disease in the new age society. Diabetes is a condition in which your body can not control the level of glucose in your blood because your pancreas does not produce insulin and body cells are resistant to the action of insulin. Glucose builds up in the blood and causes a condition that, if not controlled can lead to serious health complications and even death. The risk of death for a person with diabetes is twice the risk of a person of similar age who not has diabetes. Diabetes is a major cause of heart disease and stroke. Death rates for heart disease and the risk of stroke are about 2-4 times higher among adults with diabetes than among those without diabetes. Untreated, diabetes can cause a number of health problems including blindness, loss of circulation resulting in limbs amputation, high blood pressure, heart disease, kidney failure.

1-Type 1 diabetes accounts for about 5% of all diagnosed cases of diabetes. Type 1 is usually first diagnosed in children and young adults, although it can occur at any time. To survive, people with type 1 diabetes use insulin from an injection or a pump. Risk factor for type 1 diabetes can be autoimmune, genetic, or environmental. At this time, there are no known ways to prevent type 1 diabetes.

2-Type 2 diabetes accounts for about 95% of diagnosed diabetes eating and regular physical activity, used with medication if prescribed, can help control health complications from type 2 diabetes or can prevent or delay the onset of type 2 diabetes.

3-Gestational diabetes develops and is diagnosed as a result of pregnancy in 2%-10% of pregnant women. Gestational diabetes can cause health problem during pregnancy for both the child and mother. Children whose mothers have gestational diabetes have an increased risk of developing obesity and type 2 diabetes. Women who have gestational diabetes face a higher risk of developing type-2 diabetes in the future. Research has shown that 10-20 years after a woman has had gestational diabetes, she has a 35%-60% chance of developing type 2 diabetes.

Insulin is essential if you have type-1 diabetes and is likely to be part of your treatment because insulin is more effective for controlling the glucose level. Insulin is essential hormone; without it your body cells cannot take in glucose from your blood to use of energy. If your pancreas no longer produces insulin, or if it produces so little that pills you take for diabetes are no longer effective, you need an external source of insulin, usually in the form of regular injections. Some people receive insulin continuously through a device called an insulin pump. Insulin is measured in international units. There are 100 units to every milliliter (ml). you will usually start on a small dose (10-20) units of insulin and increase or decrease this to keep your fasting glucose level between 90-110 mg/dl. There are three rapid-acting insulin's are Humalog, Novolog, Apidra.

RESEARCH METHODOLOGY: The following Research Methodology is adopted for the proposed research paper.

- Identification of the Research Problem.
- Theoretical framework and study of related literature.
- Mathematical formulation of the research problem to analyzing the solution.
- Analysis and numerical solution of the mathematical model.
- Interpretation and statistical analysis or results.
- Conclusion.

MATHEMATICAL FORMULATION OF THE RESEARCH PROBLEM: In this research paper, using Karl Pearson Correlation Coefficient ^[4] and t-test ^[4].

$$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{n}} \sqrt{\sum y^2 - \frac{(\sum y)^2}{n}}}$$

the summation extending over i from 1 to n .

❖ Applying Student's t-test.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \sim (n-2) \text{ df}$$

$H_0: \rho = 0$ (Population is uncorrelated)

$H_1: \rho \neq 0$ (Population is correlated)

Where; ρ - Population correlation coefficient.

r - Sample correlation coefficient.

❖ Regression for glucose level (y) on insulin doses (x).

Regression coefficient
$$b_{yx} = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{n}}}$$

The Regression Equation, given by $(Y - \bar{y}) = b_{yx}(X - \bar{x})$

Now we construct the figure,

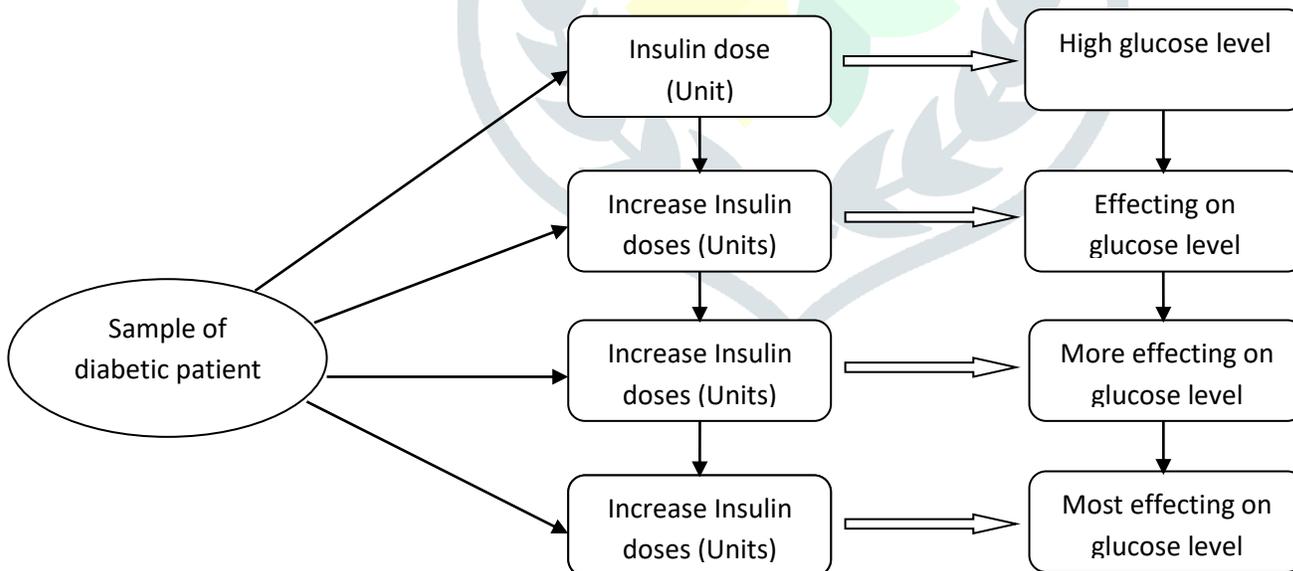


Figure wise description, the effect of insulin on diabetic patients.

CALCULATION: The data collected through 15 patients sample as given below in terms of insulin doses (x), and glucose level (y).

x (Units)	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66
y (mg/dl)	400	372	354	331	316	295	280	258	239	219	199	179	159	133	113

$$r = -0.912,$$

$$|t|_{cal.} = 8.0156,$$

$$|t|_{tab.} = 2.160$$

CONCLUSION: This shows a negative correlation and confirms the logic and validity of effect of insulin in maintaining the glucose level. Further the significance of correlation coefficient r was tested using t-test ($|t|_{cal.} = 8.156$). Here using $H_0: \rho = 0$ (uncorrelated population); and the t-value (rejecting H_0) provides a belief confirming the non-zero r value. Therefore alternative hypothesis $H_1: \rho \neq 0$ (correlated population) is accepted. This is a strong evidence of effectiveness of insulin over for maintaining glucose level in patients of Moradabad city.

Also their relationship may be expressed by regression line equation $y = -4.973x + 445.4$

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